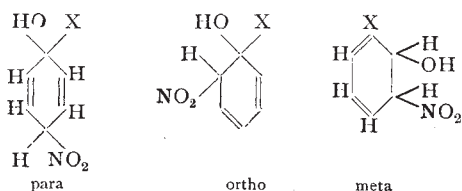


Flürscheim, and Obermüller are shown to be fundamentally untenable or self-contradictory. The author concludes :—

“Das Endergebniss unserer theoretischen Betrachtungen ist kein erfreuliches; alle Versuche, welche bis jetzt gemacht sind, um die Gesetzmässigkeiten, welche den Ort bestimmen, wo ein zweiter Substituent im Kern eintritt, zu ergründen, sind vollkommen fehlgeschlagen; ja selbst ist es nicht möglich gewesen, die Tatsachen in einer empirischen Regel zusammenzufassen.”

After discussing the position taken up by the third entrant group in chapter v., the author develops his own views on the mechanism of substitution. These views, which are published here for the first time, are so eminently simple and rational that chemists may be interested in the following brief outline. Following Kekule's idea that substitution is a succeeding phase of an additive process, Prof. Holleman considers that such a process as nitration, for example, of a compound containing a substituent X produces in the first place one or more of the following three substances :—



from which the elements of water are subsequently detached. The nature of the predominating compound or compounds will be determined by the accelerating or retarding influence of the substituent X, just as addition of bromine to an olefine will be determined by the substituents already present. If X accelerates the reaction of ortho and para, substitution will be the main result, if it retards, meta substitution (where the double link is unconnected with the X complex) will be the primary effect. If X has no marked effect meta and ortho, meta and para, or all three may be formed.

A work of this kind, which, the author tells us, necessitated the careful perusal of upwards of a thousand original papers, ungrateful and laborious as the task of compilation may have been, will always remain a standard book of reference, for which chemists will feel fully grateful to the author.

J. B. C.

FERMENTS AND FERMENTATION.

Micro-Organisms and Fermentation. By A. Jörgensen. Translated by S. H. Davies. Fourth edition, completely revised. Pp. xi+489. (London: C. Griffin and Co., Ltd., 1911.) Price 15s. net.

IN this translation of the fifth German edition (dated January, 1909) of his well-known textbook, the author has incorporated the main results of investigations made since the appearance of the previous English edition about ten years ago. Although the book has been, to a considerable extent, rewritten, its original characteristics are retained.

Five of the six sections of the work have been

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enlarged, whilst the sixth, dealing with the pure culture of yeast on a large scale, has undergone marked reduction in volume, possibly because it forms the subject of a separate publication by the author. The illustrations have been increased in number from 83 to 101, nearly all of those found in the previous edition being again given; most of the figures are good, but those numbered 12, 13, and 51 would undoubtedly bear improvement, while Fig. 80 fails to bring out the peculiar bean- or kidney-shape of the spores of *Saccharomyces fragilis*. The bibliography has been revised and supplemented; it is, however, questionable whether a bibliography placed at the end of the book is more convenient than references given as footnotes to the text. One new feature, which will be welcomed by all readers, is the provision of an alphabetical index of subjects.

As the author is a member of the Danish school of micro-biologists, the book would naturally be expected to give, as in reality it does, a prominent place to the investigations of Hansen and his followers on the micro-organisms met with in the brewing industry. At the same time, the more important researches carried out during recent years in Germany and elsewhere are not, as a rule, lost sight of, although no reference is made to the valuable work of Sclator on alcoholic fermentation, while the meagre notices given to the results obtained by Ehrlich and by Harden and Young might have been replaced profitably by more extended discussions.

The first chapter, headed “Microscopical and Physiological Examination,” deals with such subjects as staining, sterilisation, antiseptics, nutritive substrata, and pure culture methods. In this section the space devoted to technique is very small, and a more detailed description of the methods employed in the author's laboratory would have been of value. In the part dealing with nutritive media, no mention is made of “eau de touraillons,” which furnishes an excellent basis for such media, and is largely employed by some of the French investigators. Attention is directed to the stimulating action of small proportions of various poisons on the growth of micro-organisms, but no reference is made to the very thorough researches of Javillier on the influence of zinc on the growth of vegetable organisms, including moulds.

Chapter ii. treats of the biological examination of air and water, chiefly from the point of view of brewery requirements.

In chapter iii., the functions and conditions of growth of zymogenic bacteria are described. A paragraph is given to the nitrifying bacteria, but nothing is said of the very important class of nitrogen-fixing bacteria.

The moulds form the subject of chapter iv., which also deals incidentally with enzymes and with the influences of various external conditions on micro-organisms in general. The occurrence and life-history of most of the commoner moulds are studied, and reproductions are given of some of the excellent drawings made by Brefeld and de Bary.

The fifth chapter, occupying nearly two hundred pages, is concerned with the yeasts, and deals, in addition, with non-sporulating or *Torula* forms, as

well as *Mycoderma vini* and *cerevisiae*. A short account is given of the history of fermentation and of the controversy respecting spontaneous generation. Then follow discussions of the biological relationships of yeasts, variations in the Saccharomycetes, morphology and anatomy of yeast-cells, spore-formation and its application to the analysis of yeasts, and a number of allied subjects. Lastly come descriptions of the more important culture and wild yeasts met with in the brewing, distilling, and wine-making industries.

The last chapter gives a brief account of the methods and apparatus employed in the preparation and transport of cultures of pure yeast for industrial purposes.

The translation has been on the whole well done, although in some cases the English is stiff and the grammar faulty. Rather ugly split infinitives occur in moderately large number, and subject and verb do not always agree in number. Use of the expression "equal molecules of dextrose and lævulose" is difficult to defend, and "sorbite," "mannite," and "albuminoid" are nowadays better termed "sorbitol," "mannitol," and "protein." Very few misprints are noticeable; *d*-methylglucoside (p. 359) obviously refers to α -methylglucoside.

T. H. P.

THE FISHES OF AFRICA.

Catalogue of the Fresh-Water Fishes of Africa in the British Museum (Natural History). By G. A. Boulenger, F.R.S. Vol. ii. Pp. xii+529. (London: British Museum (Natural History), 1911.) Price 2l. 5s.

THE author is to be heartily congratulated on the appearance of the second volume of this great work, which succeeds its predecessor after an interval of two years, a period by no means excessive when the amount of labour involved in a task of this nature is taken into consideration. The present volume completes the account of the carp tribe (Cyprinidæ), containing the great bulk of that group, and likewise includes the whole of the cat-fishes (Siluridæ), several new genera and species being named.

Although no one regards systematic works of this class as the final aim and end of zoological science, their importance and value cannot be overestimated, since it is upon such sure foundations that all superstructures of a more far-reaching and philosophical nature must be based. That it was high time the task of bringing our knowledge of the African Cyprinidæ and Siluridæ up to date was undertaken will be evident by a comparison of the number of species of certain groups recorded in the present volume with that given in Dr. Günther's "Study of Fishes," published in 1880, and based on articles in the ninth edition of the "Encyclopædia Britannica." It is stated, for instances, in p. 573 of the "Study of Fishes" that the total number of species of cat-fishes of the exclusively African genus *Synodontis* is fifteen, whereas Mr. Boulenger has swelled the list to fifty-seven. Again, Dr. Günther estimated the total number of representatives of the Old World cyprinoid genus *Barbus* at about 200, while Mr. Boulenger gives a list (inclusive of nine additional uncatalogued species) of no fewer than

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194 African members of the genus. Unfortunately comparisons cannot be extended to the total numbers of African Cyprinidæ and Siluridæ recorded by the two naturalists, as Dr. Günther enumerates only those inhabiting Africa south of the Sahara; but, even so, his lists of fifty-two Cyprinidæ and sixty-one Siluridæ (*op. cit.* p. 230) inhabiting Ethiopian Africa are altogether outclassed by Mr. Boulenger.

This great increase in the number of African representatives of the two families has, of course, a most important bearing on previous conclusions as to the place of origin of the two groups. Dr. Günther (*op. cit.* p. 225) suggested that since the majority of the groups of fresh-water fishes common to India and Africa, with the exception of the siluroid *Clarias* and its relatives, had more representatives in the former than in the latter area, the presumption is that they are of Asiatic origin. Although these conditions are now in many cases reversed, the conclusion will, we think, still hold good in the case of *Barbus*, the members of which, like many groups of antelopes with ancestral forms in India, would appear to have undergone an unparalleled development when they reached Africa. On the other hand, the abundance of silurids in the Eocene of the Fayum, where no remains of cyprinoids have hitherto been discovered, points to the conclusion that this group is endemically African. And here it is noteworthy that the connection between the African and South American cat-fishes is now regarded as even less intimate than was the case when Dr. Günther's work was written, the two African species there referred (p. 233) to the South American *Pimelodus* now being assigned to a genus apart. But to pursue this interesting subject would demand more space than can be given to it in these columns.

If such space were available, we might presume to criticise some details in Mr. Boulenger's "keys"; and we cannot conclude without mentioning that the value of the work would have been increased if the dates of presentation of the specimens were added. The work appears singularly free from misprints.

R. L.

THE INTERNAL-COMBUSTION ENGINE.

Gas Engines. By W. J. Marshall and Captain H. R. Sankey. Pp. xvi+278. (London: Constable and Co., Ltd., 1911.) Price 6s. net.

THIS book is the latest addition to Messrs. Constable and Co.'s Westminster series, and is intended to be useful to

"those who, being either purchasers or users of gas engines, wish to know the principles underlying the design or construction and the methods of diagnosing defects when they occur, and the steps to be taken to remedy such defects."

It may fairly be said to have achieved its purpose, and, for the most part, any criticism to which it lays itself open is little more than that to which almost any first edition is liable.

The book (an unusually heavy one to handle for its size) is divided into ten chapters, of which the first three deal with the theory of gas engines and with the Otto and two-stroke cycles of operation. The fourth, fifth, and sixth chapters are concerned with